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Canadian Computer **Wholesaler**

THE RESELLERS RESOURCE

February 1996 Vol. 2 No. 1



Who is really doing Client/Server Computing?

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imaging
solutions**

- Surfing the Net on Java with HotJava
- Multi-Tier Client/Server Architectures
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- What's new on CD-ROM players?
- Q&A: Cyrix 6x86
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The hype on client/server computing is nearly dead. The market for them was vastly over estimated and didn't take into account the returned value of existing installed mainframes and databases of large computing users. Consumers of client/server computing will mainly be the small to medium sized enterprises looking to improve their computing performance.

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CCAP membership applied for in July 95

STD and Motorola build Canada's first PowerPC systems

STD Systems has started shipping the first Canadian-manufactured RISC-based PowerPC systems. STD will be marketing this new line of workstations and servers known as the Power2 series, to universities, government research facilities and educational communities across Canada. The Power2 product family is the latest addition to STD's CompuPartner line of computer systems operating on the Microsoft Windows NT 3.51 system platform. The Atlas motherboard is supplied by Motorola Computer Group running PowerPC 603, 604 and 604 microprocessors.

With a 19% market share of the Canadian educational market STD is one of the leading distributors in Canada. Paul Tong, president of STD Systems, says the PowerPC technology is an appropriate fit for the market's needs. "The PowerPC is an ideal technology for research and high end applications, where users need powerful CPUs. Our systems with Motorola's technology, definitely offer the best combination of preperformance in the market. Motorola has an outstanding reputation for delivering quality products and engineering skills. STD has the marketing and distribution strengths to complement these skills."

For more info, contact STD 518 660-3333/Ext. 886 or apple@std.net



COMDEX/PacRim set attendance record

Over 30,000 people attended the 4-day COMDEX/PacRim '96 trade show from Jan 16-18, 1996 at the Vancouver Trade and Convention Centre making it the largest information technology event in the Pacific Northwest. In its second year, the COMDEX/PacRim show grew more than 20% over the '95 event. It attracted over 15 BC based companies, as well as 63 US and 113 companies from Ontario and other Canadian provinces.

More than 250 exhibiting companies filled the floor with new products and services. Companies included 3M Canada, Apple Canada, Compaq Canada, Digital Equipment of Canada, IBM Canada, Microsoft Canada, Motorola, Novell Canada, Xerox Canada, Internet Direct and Canadian Computer Wholesaler magazine.

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INDUSTRY FLASH

EMU picks up Data General AViON servers

Data General Canada and EMU Data Systems Ltd., have signed a national distribution agreement. EMU will distribute Data General's new line of Intel based AViON servers.

The servers range from single processor units up to 4 processors and can run over 13,000 UNIX applications from such vendors like: Computer Associates, Informax, Decade, PeopleSoft, Peak Systems, Progress, Sybase, Tivoli, Unidata and Vmeclip, as well as the approximately 1,000 Windows NT based programs.

Digital's Super Spider takes 2 million hits on Web

One week after its introduction, Digital Equipment of Canada's advanced "super spider" technology, code-named Alta Vista, has become the fastest-growing information search and indexing service on the Internet's World Wide Web with over 2 million users daily. It is up to 100 times faster than other spiders.

Digital's super spider technology surpasses the limitations of current information services by delivering the most complete, precise, and up-to-date information of the Web's entire text. It conducts the most comprehensive search of the entire Web using an magnitude faster than spiders used in conventional information search services. The super spider crawls and dispatches a "flood of spiders" that crawls the entire Web. Second-generation scalable software simultaneously locates and indexes text as it finds Web pages. A powerful search engine enables Web users to conduct precise searches for specific information by looking for phrases, specifying key words, using cross-sensitive matches, and restricting searches to titles or other parts of a document.

The super spider has crawled the Web at up to 3.5 million pages per day, finding and indexing more information than any other spider or crawling service. It is on route to finding every page and indexing every word of text on the Web.

You can try Alta Vista at <http://altavista.digital.com>.

Ingram puts computers in Classrooms

In an initiative valued Future Frontiers, Ingram Micro will allocate one dollar from the sale of each computer into a funding pool reserved for the purchase of computers to be awarded to schools across the country.

The systems will be apportioned by the percentage of CPU business Ingram Micro conducts in each province, so results can be assured that their purchase will directly benefit their local community. In addition, the program will focus on targeting schools in the rural and lower income communities where community based funding is not readily available. The percent of the systems will be awarded to schools for physically and mentally handicapped children. Smelters will be encouraged to participate in this program by offering to support the installed technology and they will be encouraged to nominate recipient schools.

Digital Users meet at Hyatt in Vancouver

DECUS or Digital Equipment Computer Users Society is holding its 29th annual meeting at the Hyatt Regency Hotel in Vancouver from Feb. 26 to March 1, 1996. The theme of the event is "Elevating the Distributed Enterprise." <http://www.decus.ca>



by Edward Trajankowski

Client/Server Computing

- who's doing it?

**There's a joke going around the computer industry:
client-server computing is like teenage sex.**

Everybody thinks everyone else is doing it.

Fewer people are doing it than you think.

Those who are doing it aren't doing it well.

And everyone hopes it's going to get better.

**Client server has become a catch-all
phrase for whatever anybody is doing.**

You can't sell a client-server because there's not such thing. You can sell a client-server system that includes server hardware, client hardware, networking hardware and the software that pulls it all together. If you go to the retailer to put the client-server package together that can do the job to suit each individual situation.

The definition of client-server changes depending on who you are talking to and how they are packaging their particular brand of client-server. By client-server technology, we mean two or more machines working on an application cooperatively, across a network, integrating hardware and software. In some circles the basic act of file sharing is considered to be client-server computing, but technically it is just one aspect.

For many people, client-server implies a migration from mainframe computers to the desktop. There is a greater number of mainframes installed than ever might realize, but more of

them are operating in a mixed environment on a network with desktop computers and work stations. The Gartner Group, an information technology market research company based in Stamford, Mass., predicts that in 1994 the world-wide market for client-server products and services would exceed \$300 billion U.S. dollars, even closer. In its September 1993 report, *The Pace of Mainframe Migration*, the Gartner Group said "...the expectations on the death of the mainframe and the dominance toward client-server systems have become tempered by reality."

Rather than turning their backs on their large investments in mainframes, many large companies are maintaining their installed databases on mainframe computers and using them as servers and using Intel-based desktop PCs running Windows as clients. It is smaller organizations without the installed mainframe base who are moving more aggressively towards a

completely distributed computing model. The market is in the smaller to medium sized companies and that is where the real growth is.

Users point out that each platform has its strengths. Mainframes are good at moving large volumes of data to many users very quickly. PCs are good at local manipulation of existing data and mid-sized machines act as intermediaries between the two by behaving as temporary warehouses for data. A client-server application can be broken down into segments and each put on the computer platform that makes the most sense. The user at the intelligent desktop with a graphical interface can talk to another part of the system, and the data can be stored in a third part of the system offering even more responsiveness, enhanced usability, greater flexibility. People with no understanding of the underlying client-server technology can use it more effectively than a traditional mainframe.

While it can cost as much as 50 percent more than traditional mainframe technology, a client-server system allows you to scale your system to small, low expenditure, increments. If there is another user all you have to do is buy a new PC and put it on the desk.

Computing used to be like going to Sears to buy everything that you want—home goods, electronics and clothing," says Bill Harris, Enterprise Marketing Manager for PC hardware at Digital Equipment Corporation, Canada. "Client-server computing is like going

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Who's really doing Client/Server computing?

The formal underpinnings of the client-server model come out of the communications world where the idea of the client requesting something on one machine and having it happen on another machine and getting a response back originated.

(Continued from page 12)

to the shopping mall. You still have the department store that provides a number of services but you also have specialty shops like Radio, the Big and Tall Shop and Radio Shack. I can get the kind of services that I want instead of always having to go to Sears's."

The formal underpinnings of the client-server model came out of the communications world where the idea of the client requesting something on one machine and having it happen on another machine and getting a response back originated. Since then, the path has taken us from batch processing, to time sharing to personal computing, and now to client-server computing. The emergence of high-performance low-cost desktop machines driven by Intel and Microsoft made computing available to everyone. Gacc Computer Corp., the Markham, Ontario-based maker of virtual library, financial and business applications and one of the first to integrate software, hardware and telecommunications integrating services, is now redeveloping its products for the client-server model.

"We're doing client servers for 1800 user systems and we're doing client-servers for one user systems," says Steven Eckhardt, business partners manager for Gacc Canada. "From large companies like CIBC and large libraries to small construction companies, we're doing client-servers across the board."

The fast growth of Microsoft Windows NT and the accompanying lower cost and broad availability of software for Windows NT is also driving client-server computing. The release of Microsoft Windows NT Workstation operating system version 3.11 in June has again spurred the client server buzz, handling the desktop as the center of the client-server computing universe. Windows NT Workstation 3.11 sells for about \$425 per license with French, Mandarin Chinese (traditional and simplified), Korean, German, Dutch, Italian, Spanish, Portuguese, Russian, Swedish, Danish, Norwegian and Finnish versions available as well as English. Some analysts think this single operating system, that can run all the parts of the process including the client, the server and print servers, will be the impetus that will drive client-server computing into the mass market.

The great thing about Windows NT is it's a platform that combines the traditional file and print services with the traditional client-server services," says Owen Sjogren, product manager for Windows NT, Microsoft Canada. "Windows NT is the best foundation for the new generations of computing, because mainframe and UNIX require a lot of expertise."

"A lot of our work is being done right now with Microsoft," says Digital's

Bill Harris. "We anticipate that 99 and 40/100 percent of all the clients in a client-server environment will be Microsoft based clients and we anticipate that a very large percent of the servers will be Microsoft based servers."

Digital has moved squarely into distributed computing, committing itself to a wide range of Intel and Alpha servers with NT and UNIX operating systems which seems to be the direction its customers are heading. It has also added a wide range networking hardware products - including routers and bridges, as well as middleware software.

Sybase Canada doesn't think Microsoft will offer the complete solution. Dave Toocood, technical manager for Sybase Canada, says his company's client-server software ties the desktop to the back office and leverages the products you already have. "If you look at Microsoft as the only solution you won't be able to integrate as tightly with legacy systems. Basically you have to throw away what you have and begin at the new as a very short period of time."

What many resellers are looking at is organizations will have to upgrade their computers to keep pace. As technology evolves, existing systems will not have the performance or hard drive storage or memory to perform and they will need more networking components and look at software flexibility to operate over faster data lines.

It allows resellers to sell a complete package including consulting, a central server software, networking and the workstation. As it evolves, the reseller will maintain an ongoing relation because the nature of client-server computing requires more services and consulting. □

Java and HotJava: a little background

By Dan DeBelle

Not your average cup of Joe

Java is exciting! It's impressive! It has the potential to significantly change the way we think about and approach networked computing. Its introduction in conjunction with the Internet could very well mark the beginning of a new era in computing.

Yes, computing in general and the Internet in particular are widely hyped; this industry thrives on it. No, this stuff isn't going to cause world peace, and all human suffering, cure baldness or even common diarrhoea. For that matter, having said this, Java is not hype. There is a powerful reality behind this new programming language and environment. Maybe you will be as impressed as I was.

The purpose of this article is to give a conceptual overview of Java. Those interested

in a more in-depth understanding of Java and Java-related subjects should visit Sun Microsystems' Java website at <http://java.sun.com>. *The Java Language: A White Paper* and *The HotJava Browser: A White Paper* are both available at this site.

A little ancient history

The core technology of Java is an outgrowth of a consumer electronics R&D project started by Sun Microsystems in April, 1991. The goal was to develop advanced software for a variety of networked devices and embedded systems devices which are attached to and communicating through a network. They needed a small, reliable, portable, distributed, real-time operating environment. Starting with the C++ language, they tried to stress the compiler, a critical part in making the portable and

platform-independent environment they wanted. This approach soon proved too problematic. Realizing the problems they faced could best be address by developing an entirely new language, they began working on what they then called Oak, which would later be renamed Java.

Java was first used in developing a prototype PDA (personal digital assistant) like device, this went nowhere due to a consistent market, which Apple's Newton later demonstrated. They then applied their Java technology to the Set-top box and video-on-demand market, this also didn't pan out for a number of reasons.

By the spring of 1994 it was obvious the Internet and more specifically the World Wide Web was exploding in popularity with the re-

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Surfing the Net on Java with HotJava

lines of the NSCA's Message, the first web browser and graphical interface to the Web. They realized the potential of Java in combination with the Internet, the mother of all heterogeneous networks. Their new mission was to supercharge web browsers. They began porting Java to the PC, Mac, and Sun platforms and developing a web browser in Java. The result was HotJava. The Java Environment and HotJava were formally announced by Sun at Sunworld '93 in May, 1993.

Java

What is Java? It's a group of technologies. A programming language for developing applications, an architecture for running those applications and a set of tools to build and compile these same applications. Java incorporates a variety of features which include being portable, architecture-neutral, interpreted, dynamic, object-oriented, high-performance, multithreaded, secure and robust. This allows Java to send architecture-

neutral code that is dynamically loaded and run on any heterogeneous network. If you don't quite understand what all this gibberish means, read on, I'll try to explain.

It is important to keep in mind that Java's features are determined by the nature of the computing environment in which the software must be deployed. At a glance, this means supporting applications on multiple incompatible hardware architectures, multiple incompatible operating systems and one or more incompatible graphical user interfaces, all within a distributed client-server or heterogeneous network.

Java allows you to run the same application or program created with Java on any machine you choose as long as a Java interpreter and run-time system have been ported to that same machine. The run-time system and interpreter can most easily create a program, such as a WWW browser like HotJava, or as a stand alone applet on the machine.

To understand how Java achieves this portability, you must first understand how a program written in another language handles this process. First a program is created in its own C++ code. The program is then passed into a compiler which takes the program and creates source code for the program to become an executable, that is a program that can be run on your computer. It must be converted into machine or native code. A compiler handles this task. This all sounds simple enough, but the problems begin here. Every platform has its own compiler, and the program will only run on the platform if you use the correct compiler for that specific platform. Compilers also cause a number of other headaches for programmers, which I won't elaborate on here. With the number of different platforms out there you can see that compiling and compatibility issues would quickly add up. This also creates some real complications in a heterogeneous network where any kind of machine could be sitting at the other end of the connection.

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Java gets around this problem by having their compiler compile the source code to a machine that doesn't exist—the Java Virtual Machine. The program now takes the form of an architecture-neutral intermediate format called Java bytecodes. In this form the program can be sent over the network to any machine or played directly on any machine, as long as the Java interpreter and run-time system have been ported to that machine. In a sense the Java interpreter is tricking the Java bytecode into thinking it's running on the Java Virtual Machine. By this little trick, Java has reduced the number of applications to be ported to any platform to one, the interpreter. After this, any applications programs or objects created in Java can run on any platform which has a Java interpreter and the run-time environment. Now, think this?...

Java could be used as the principle engine for interaction and behavior of objects in the next version of WWW. It could be used to provide all kinds of stand-alone applications which are retrieved over the network, used and returned. It could be used in any number of innovative ways because of its dynamically extensible and portable nature.

The portability of the system also depends on the basic data types and arithmetic operators. Java specifies basic data type sizes and arithmetic operator behavior unlike the C programming language where data sizes vary different ways depending on the underlying hardware and OS. This has the effect of making the Java program hardware independent. There are a number of other smaller issues that help complete the portability of the system, but these two issues are at the heart of Java's portability.

Java is truly an object-oriented language; another critical feature for a language to thrive in a complex, network-based environment. Object-oriented is one of the most used and abused words in computing, let me define for you a very basic idea of what this paradigm means. In object-oriented computing the most fundamental unit is the object. The idea behind this is that we all live in a world of objects and are used to dealing with them in our everyday lives. Let's use as an example a hammer. A hammer has certain properties and it can be controlled in certain ways. When you use a hammer you don't worry about having to define it and tell the wood and metal atoms what to do, you just pick it up and use it. It's an object. In this same sense, you created and define an object in computing and after that you can keep on using it. In Java the object is referred to as the class. The class is a reusable and dynamically loadable object which encapsulation functionality in a collection of variables and methods. The class can be used as a template to create other classes with additional functionality. Java also allows the dynamic loading of classes. This means that if additional functionality is needed while using an application new classes can be linked, on-the-fly, that encapsulate the methods needed ensuring a seamless interaction. As an example, you are cruising the WWW using a Java enabled browser you access a graphic file for which you don't have a helper application. Instead of not being able to retrieve the file, the Java browser can ask the server for a class that can display the file. It would load this class and the file simultaneously and bang...up comes the graphic seamlessly.

Java is a robust environment, an absolute necessity when you are automatically loading and running Java programs. Java does not use pointers it has raw memory arrays. This eliminates the chance of over-writing memory (usual no-no) and corrupting data. Java also has automatic memory management in the form of a garbage collector running on a low priority thread in the background, this allows objects without

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Surfing the Net on Java with HotJava

references to be cleared from memory when the program is not busy using processor cycles. Java is also secure

which is closely related to robustness. The elimination of pointers makes it impossible to jump across to data structures, a common activity of viruses. Java checks the code for language compliance at both the compiler and interpreter levels, due to the possibility that code could have been altered between compile time and run time. The interpreter also continues its security checks by watching the classes loaded and making sure they only access the file system in the correct manner.

Java is also high-performance. In a language which features such robustness, security and portability you would expect some loss of performance, certainly interpreted code can't run as fast as native code, but Java does a good job of getting around these obstacles, reducing the amount of overhead where it can. With built-in multithreading Java uses a low priority thread to do system maintenance and memory management when the processor is idle. The compiled Java bytecode is also surprisingly fast at interpreting down to machine code, since they are very similar.

HotJava

HotJava is a dynamic second-generation Web browser. It is the first major end-user application created with the Java language and runtime environment and therefore incorporates all the functionality of Java. The most important feature being its ability to dynamically add new capabilities. It should be noted that a number of companies have licensed Java for incorporation into their products. The newest beta versions of the most popular browsers, such as Netscape Navigator 2.0, are now Java enabled.

Conventional Web browsers allow the downloading of static pages which are limited to the data types that the browser recognizes. These must be hard wired into the browser or added as helper applications. This causes obvious problems when new protocols and data types are introduced; the browser keeps growing in size and complexity. The interactivity is limited to point-and-click

hyperlinking, which allows you to navigate through the data in a fairly seamless fashion, but is not interactive in the truest sense.

HotJava can dynamically download Java programs or applets, from anywhere on the Internet, which are then run locally on your computer. This allows the browser to dynamically add to its capabilities in terms of content, data types and protocols. This also effectively moves the interactivity away from the Web server and onto the Web client.



In terms of content, this means that anyone browsing the Web who comes across a page containing an applet could use and interact with that applet in real-time. Once again this is because the program or applet is sent automatically over the network and resides on your computer just like any other application you have on your computer. There is currently a growing population of applets on the Web that ranging from animation to spreadsheets.

HotJava is small compared to traditional browsers since all the protocol and data handlers are brought in off the network when needed. For data types this means that when the browser comes across something that it doesn't recognize, it looks for the appropriate handler on the server, as long as it is there in Java code, the browser will upgrade itself on the fly and display the new data form. No need for all those helper applications. Protocol handlers get installed in a fashion similar to data handlers. HotJava is given an object reference to an URL. If the handler for that protocol is already loaded, it is used. If not, Hot Java

searches the local system and then the system that is the target of the URL, for the protocol needed to interact with the object, it's then incorporated dynamically. This means you will not need multiple browsers to access data on different servers each with its own proprietary protocol. Also, vendor's products will integrate more seamlessly with each other, saving great pain for themselves and their users.

Security is of great importance when dealing with a large and heterogeneous network such as the Internet. When you are downloading, installing and running fragments of code imported from all over the place there are obvious dangers. HotJava incorporates all the security measures built into Java, which were described earlier. Could a computer virus get through Java's security measures? Only time will tell.

In Summary

Is Java C++ done right? The jury is still out. Java is a very new technology, in its early stages of development. Considering Java was only introduced six months ago, its off to a roaring start. It has already gained widespread acceptance and support throughout the Internet community, and is aiming to become the universal standard for transfer of dynamic, executable content over the Web. An impressive list of companies have signed up to become Java, including Netscape and Microsoft.

A developers conference recently attended a San Francisco was packed with Java enthusiasts. Who knows what applications will be developed over the next year by these people. It could be used as the principle engine for interaction and behavior of objects in the next version of VRML. It could be used to provide all kinds of stand-alone applications which are retrieved over the network, used and returned. It could be used in any number of innovative ways because of its dynamically extensible and portable nature. Lucken and goodnight, start your engines... let the conventions begin! ☐

About the Author: Dan Driville is a computer consultant and programmer; he can be reached at ddriville@direct.co.uk



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by Gary Duxon

Things you didn't bargain on - Terms the Law includes in your Agreements

Most of us acknowledge that written agreements have a place in business.

In the computer supply business, I think we are seeing a shift away from manufacturers' representatives and hardware suppliers to an industry of VAR's and system integrators. Clients are looking more for solutions than hardware. All of which increases the likelihood of honest expectations and the resulting disputes.

My focus as a lawyer is to help parties reach and document their agreements. I believe that any agreement has to meet the needs of all parties to the transaction. It is tempting in the face of a potential sale to avoid a full discussion of all of the purchaser's needs. My belief is that a full discussion of the issues can only enhance the chances that a project will be successful, and that reducing the parties' respective commitments to writing increases the likelihood that the commitments will be kept. As you would expect, I encourage contracting parties to follow this strategy on the basis that "an ounce of prevention is worth a pound of cure."

But not every arrangement is fully or even adequately documented. And disputes can and do arise. When they do, the law often includes terms in the agreement by implication. You might find a summary of some of the decided legal costs informative.

Before reviewing them, a list of the issues. A dispute can be based on specific terms of an agreement, or on terms (implied) by law. The latter are not actually included in the written portion of the agreement. Most commonly, these arise from the *Sale of Goods* legislation in your jurisdiction or, in the United States of America, from the Uniform Commercial Code (UCC).

Legislators in the U.S.A. are also currently examining the UCC with respect to the degree of protection that a purchaser of "black wrapped" software should get. I am

advised that legislative changes can be expected, although not as consumer driven as we might expect.

The most common *Sale of Goods* implied warranties arise when the goods are sold on description, or if the purchaser relies on the skill and knowledge of the vendor. When goods are sold based on their description, an implied warranty that they will meet the description arises. Additionally, an implied condition that the goods will be of merchantable quality might also apply. This means that the goods will pass the test if, after examination and knowing of the defects in the goods, a reasonable person would still purchase them. Lastly, if the purchaser can show that she relied on the skill and knowledge of the vendor, an implied warranty that the goods will be fit for the purpose they were purchased for will apply.

If your project is characterized as a sale of goods, there can be an implied warranty that the system will be fit for the purpose that the purchaser specified.

If the purchaser does inspect the goods, and then accepts them, she can lose the protection of some of these implied warranties.

A sale of goods is distinguished from other arrangements, such as agency relationships and contracts for the provision of work and materials. To the extent that all or a portion of a contract is characterized as a contract for services, your obligations might be limited to having to perform the work with reasonable skill and care, and in a good and workmanlike manner.

What this means is that if you are selling work and materials, you must use a reasonable amount of effort to succeed, ensuring that you

are competent in the first place, but the outcome need not work exactly the way the purchaser wants it to. On the other hand, if you represent to the purchaser that you can provide a solution, you might find yourself in a *Sale of Goods* transaction where the system must be fit for the purpose for which it was purchased.

As an aside, the limitations of warranty commonly found in shrink wrap licenses are usually unenforceable. The common reason for this is that the clause was not available at the time of the purchase (for example, sealed inside the package with the license) - in other words, the purchaser was not given notice of the clause. The same can apply to any warranty limitations that you wish to rely on. The customer must be made aware of the limitations before the contract is made - and in some cases these limitations of liability might not be enforceable if they are viewed as being contrary to public policy.

Implied terms can apply even if your agreement is not in writing.

A brief taste of three of the cases decided in the last few years.

A banking supply business contracted for the design of an inventory control, point of sale, and accounts receivable system. As it turned out, the system as designed could not handle the complexity or amount of inventory. The defendant was also accused of not providing the necessary assistance. In other words, the system was not fit for the purpose the business wanted it for. Damages were awarded sufficient to put the business in the position it would have been in if the contract had not been entered into.

In another case, also involving inventory control and point of sale equipment, the store owner also claimed that the system sold to it was not fit for the intended purpose. It turned out that in addition to requiring a system that could handle the functions of a retail store, the store owner ran a substantial jewellery repair

fracturing business. In this case, the court reminded us that the burden of proof is on the store owner to prove that a goods in purpose invoice. The court went on to say that the store owner knew all about the requirements of its business and was under an obligation to communicate this information. The action was dismissed based on the failure of the store owner to provide this information.

In a third case, the defendant was commissioned to design and install a system for use in a retail computer store business. The owner of the business knew that the defendant had never designed a retail computer software system before. The defendant wanted to get into this part of the software business, and was prepared to do the work for a significantly discounted price. The defendant gave strong assurances that it would be able to accomplish the task. The system never did work, for many reasons. Again, the court decided that the defendant failed to supply goods reasonably fit for the purpose intended. The court went on to say

that the owner of the business never agreed to participate in an experiment that would disrupt its business. The owner of the business was awarded all of its expenses flowing directly from the basic agreement between the parties.

Looking at it from the point of view of a sale by description, even if you are only selling a few basic workstations, it might pay to specify in the purchase order all of the details that are relevant. You might want to go so far as to include exact product specifications to ensure that the customer does not claim that she got confused or was misled when components, chip sets, etc., differed from what was described.

A full discussion of risk allocation before starting a project can avoid terms being implied into your agreement that were not bargained for or that are different than you intended.

The message is the same, regardless of the amount of customization involved. To the extent that the purchaser wishes to rely on the supplier, there is an obligation on the purchaser to clearly set out the purpose for which the products are purchased. And in the case of the supplier, there is an obligation to deliver a system that meets the purchaser's needs as they are expressed. In a *Sale of Goods* transaction, it is not enough to give it your best shot and then fail.

To put it another way, it is usually in both parties' interest not to hurt the other. If both parties recognize that beyond their own self interest they have an obligation to fully explore the issues, the temptation to just make the sale and grind the best price can be avoided - and the relationship can do nothing but improve in the light. ☐

Gary Davis practices law in Vancouver, specializing in intellectual property and licensing. He can be reached at (604) 759-7011 or at gary@dlaw.com.



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Epson announces color digital camera under \$750

The Epson PhotoPC looks and feels like a standard 35mm camera. It measures 6.6 x 3.5 x 1.9 inches. It captures 24-bit images in 16.7 million colors at 640 x 480, 320 x 240 resolutions. The PhotoPC uses an 8-megabyte MB of flash memory that can store 16 high-res images at 32 standard sizes. Memory can expand to store 180 standard images. The camera accepts an 37mm video camcorder lens or filter, allowing the options of wide angle and telephoto lenses. The flash works from 3 to 10 feet. It comes with cable to PC and EasyPhoto from Sigma Software. EasyPhoto provides image management and image enhancement capabilities. Macintosh version expected in spring of 1996. SRP \$835.

Epson web site: <http://www.epson.com>

Agfa launches TwinPlate scanning technology

Agfa launched DocScan, a scanner offering true optical resolution of 1,000 x 2,000 dpi and a color scanning depth of 36-bit, at Vancouver's COMDEX/Pacific '96 computer exhibition. The 8,000-element CCD offers 1,000 dpi over an 8-inch width, by controlling the stepping motor, it can produce true resolution of 3,000 dpi and have interpolated resolution to 4,000 dpi. The TwinPlate design allows the user to scan reflective art and transparencies on separate scan beds for independent control over the focal length of the optical path. To eliminate optical distortion, the glass plate between the lens and the transparent original were removed. To synchronize the transparency lamp and the CCD charge, a factory-adjusted, fixed coverage is used to determine the exact optical path.

DocScan comes with a universal file holder frame and slide holder and the Agfa CD-ROM which contains PostLoop 2.66 scanner driver, PostLoop color conversion software, and a full version of Alpha PhotoShop in Mac or Windows formats. PostTune color management software, QuarkXPress, Postone color calibration and ColorSync 2.0 and ICC profiles. Options include file holders for book-scanning. SRP is \$7,700.

Lotus SmartSuite 95 Edition for Windows 95

Lotus Development Canada Ltd announced the SmartSuite 95 Edition for Windows 95 will ship beginning in February. SmartSuite includes completely rearchitected 32-bit versions of the Word Pro word processor, Freelance Graphics presentation graphics, Approach database and SmartComposer word command center, as well as updated versions of the 1-2-3 spreadsheet, Organizer personal information manager, and ScreenCam multimedia tool. The new program features 32-bit multitasking, long file names, GLE 2.0 support and integration with the Windows 95 desktop shell.

SRP for SmartSuite 95 is \$595 and previous years of Lotus programs can upgrade for \$225.

Digital server offers more transactions per dollar

Digital Equipment Corp and Microsoft Corp announced the world's best TPC-C benchmark price-performance results for a single-processor system.

Results of 1153.7 transactions per minute (tpmC) at US\$226/tpmC, based on the TPC-C benchmark Rowset 3.0, were achieved on the microprocessor AlphaServer 1000/4266 system running MS Windows NT Server OS V3.51 and MS SQL Server V6.5 client-server database management system in a heterogeneous client-server environment.

With a total system cost of US\$364,653, the AlphaServer 1000/4266 system delivers 59% better throughput performance and US\$4.49/tpmC less than the IBM RS6000 650. It even delivers superior performance and price-performance to the dual-processor Sun SPARCServer 20.

Fujitsu ships 10 and 14 ppm printers

Fujitsu announced the availability of the PrintPartner 10 and PrintPartner 14, two 400 dpi, network-ready laser printers with 1200 dpi class printing capabilities and speeds of 10 and 14 ppm respectively.

Users can select true 300 and 600 dpi or 1200 dpi class printing. It also uses advanced memory techniques to process more information with the same amount of RAM. Standard features: 2 MB RAM using 72-pin SDRAM for up to 34 MB, 250 sheet paper tray, high-speed bi-directional parallel connection interface, PCL 3e emulation, 35 built-in, 10 True-Type, and 1 bitmapped font.

The 600 dpi printer includes 1200 dpi with Fujitsu Enhanced Imaging Technology. The toner is also capable of producing HICO or magnetic ink documents for making checks.

SRP is \$1,195 for the PrintPartner 10 and \$1,345 for the PrintPartner 14.

Claris ships Oracle Power Objects

Claris Canada is now shipping Oracle Power Objects, the first visual programming tool to support cross-platform development on Windows and Apple Macintosh platforms simultaneously.

Developed by Oracle Corp and marketed by Apple Computer, Oracle Power Objects allows developers to easily move applications from one system to another without recoding. Power Objects runs simultaneously in Windows 3.1, Windows 95 and Macintosh environments.

Oracle Power Objects Standard Edition 1.0 has an introductory price of \$135 and Oracle Power Objects ClientServer Edition 1.0 has an estimated street price of \$4,000.

Sharp PDA has backlit screen

Sharp Electronics of Canada is introducing a new Zaurus keyboard-enhanced personal digital assistant with expanded on-line communications and PC connectivity. The Zaurus ZR-5800 offers connection to on-line data services and to the Internet. The ZR-5800 includes Comprehensive Companion for Zaurus, AT&T Mail, Page Access and PostCell, a Microsoft Excel compatible spreadsheet. It also has 3 MB RAM with 1.6 MB for user space and can be expanded with another 2 MB with a SRAM card. Also new to the unit is a backlit display making users to work with the unit in dark areas. Users can also use Microsoft Mail or Lotus cc Mail for sending e-mail and other documents by infrared, modem or cable connection. Word processing documents on the ZR-5800 are in Rich Text Format and can be edited in MS Word without reformatting. Weighing 245 g (13.6 ounces) the unit is powered by 3-AA batteries.

Perle 833 for IBM remote access

Perle Systems announced the availability of a Token Ring version of its Perle 833 Remote Access Server. The current version is deployed by organizations to allow mobile users dial-up access to mission-critical resources on Ethernet LAN systems.

Perle 905-673-8885.

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As the imaging peripheral market continues exponentially every year, new VARs are faced with the challenge of entering a field already saturated with players. Competition is fierce and continues to be so even after becoming a member of the team, because older, more experienced VARs command a large portion of the game, and more players join every day.

Don't become discouraged. Imaging is an emerging market and for new VARs who are willing to develop a sound business plan and make the commitments, the opportunities are there.

The information age, as it has been characterized, represents another stage in the evolution of the corporate world. With the demand for information growing at an alarming rate, the need to organize and access the information must also grow.

Unfortunately many companies who depend on the storage, quick search, retrieval, and delivery of information are still heavily reliant on cost-inefficient manual methods. As improbable as it may seem, many of these

management has become so complex, is nature and so difficult to configure, that few can or are willing to tackle the problem without help.

Providing the much needed help to these corporations is where the opportunity for you, the imaging VAR, comes in, but only if you understand that imaging and record management is not just about selling hardware.

The most important fact to keep in mind when coming out as a VAR is that your clients need help sorting through the confusing array of products and information available. Arm yourself with the right knowledge and the attitude that will enable you to become a consultant to your clients and soon you will be well on your way to establishing long-term relationships, which in turn will result in future sales.

Because scanners are often the main component of an imaging solution, knowing all that you can about them is a good place to start building your knowledge base.

You will find that frequently customers underestimate their need for a scanner but have little idea of what it can really do for them or how it



Selecting the right Scanner

The scanner is at the heart of the imaging solution process. Its productivity can be related to the success or failure of the solution. Determine what level of productivity your client needs and then be relentless about finding the right product for the job.

There are many issues to consider such as what type of documents are being scanned and what the daily volumes are. If it's for personal use, scanning no more than 100 documents per day, a flatbed scanner may be the answer. However, when volumes run into the thousands, a production level scanner is required.

Some of the issues you will need to consider:

Selling imaging solutions to the paper challenged

by Malcolm Cook



Of course, many corporate executives are well aware that inefficient document management is costing their firms valuable time and profits. However, understanding the problem and doing something about it are two different issues. Even the executives who are aware of the existing technology are afraid to tackle the problem on their own. Transforming information into computer-usable data is no easy task. Documents

might fit into the "fugger picture." You can help, but be careful. A common mistake is an attempt to sell a scanner to fit a client's application without knowing if it's the correct solution. Take the time to verify that the client actually needs the scanner and which type will work the best. You can only act as consultant, and make sound recommendations after completely observing and understanding your client's imaging problem.

Helping your customer understand how a scanner can benefit them and how it can become part of the total solution has its rewards. Selling the right scanner as part of an overall solution can become your window of opportunity. This is your chance to level the playing field and even take a lead in the imaging industry.

Fortunately, today's scanners offer such a variety of features that, with a little homework, you should have no problems matching the needs of your clients with the right scanner solution.

Throughput

Throughput refers to the speed at which the pages enter the system, measured in pages per minute. Important though this is, you must not overlook a very important factor—operator involvement. Scanners designed with the operator in mind can greatly improve throughput.

Consider that in many environments the operator will be scanning for most of the day, so the height and positioning of the scanner comfortable to ensure maximum productivity? Does the feeder have front feed and return to eliminate awkward reaching? Remember that no matter how fast the scanner is, if valuable time is spent reaching from one end of the scanner to the other, the net result could be decreased productivity.

Paper Handling

Don't get bogged down with all of the different types of mechanisms available for feed-

(Continued on page 38)

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81	2070	USA	81	2070
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Keywords: Independent System Operator; Electric Power Industry; Energy Markets; Electricity; Market Design



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Figure 1. The study area.



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10.8.1 **How to Use the Command**

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Abstract

1. The first step is to identify the problem.

1. **Introduction**



(Continued from page 24)

ing documents through the scanner. Handling is the real issue. The transport should be measured in its ability to efficiently handle the types of documents that your client is likely to have with minimal jamming.

Be realistic about the shape and condition of the materials to be handled. Investigate what kinds of documents are to be scanned and attempt to choose a scanner that can best accommodate the types of paper and the condition of the materials that will be scanned. It should be one that minimizes jamming and one that can be cleaned and put back into production easily.

It is also good policy to understand the basic repair procedures for a given scanner so the event of a possible paper jamming problem. As a VAR, you may have simply advised your client to buy a particular scanner but most likely you will be the first person contacted when something goes wrong.

Demonstrating your knowledge and being able to help solve the problem is yet another opportunity to provide the kind of service that will make you stand out.

Image Quality

Image quality and reliability is critical to consider when preparing the right imaging solution. The scanner you choose should include image enhancement technology. It is important for the operator to have the ability to sharpen blurred images, eliminate marks and adjust contrast to equal or better the quality of the original document.

The quality of scans can be the determining factor in the success of your imaging solution. The fastest scanner in the world won't compensate for the loss of time in having to redo poor quality scans.

Another point to note is to be sure that the

imaging quality you are recommending is what is required. Although in theory the more dots per inch, the better the final results, depending on the circumstances, less dpi may do just as good a job. For example, 300 dpi is a logical choice to use for word- or invoice scans, instead of a higher dpi value. This lower dpi would expedite production time, while maintaining quality at an acceptable level.

If the system does not have good image enhancement technology or if it is operating at too high a dpi and slowing down the operation, your client may lose money and hold you accountable.

Operator Ergonomics

Whether using the scanner for a few hours or for long extended days, it is important to provide proper ergonomic conditions for the operator. An efficient and comfortable environment can be achieved with features such as unobstructed, same-side paper entry channels, adequate work space, and proper scanner height.

It is essential that there is enough room to manipulate the scanned images and the originals, because maneuverability and paper feeding simplicity will ensure positive work conditions.

Ergonomic considerations may seem obvious to you but your client will appreciate this type of value-added information from you.

Reliability

The reliability of a scanner can be measured by the number of pages it can scan in a given number of hours per day. After all, it is necessary to know just how well the scanner will perform and at what rate, without overworking either the scanner or the operator.

When recommending a scanner, it is common sense to know the manufacturer's history

DOCUMENT IMAGING TERMINOLOGY

Bitness - Image data where each pixel can have a value of black or white, but no other values.

Daily Duty Cycle - The maximum number of documents that can be scanned per day as specified by the manufacturer.

DPI - Dots per-inch. The number of pixels generated per inch of paper. The higher the dpi number, the larger it will take to scan but the image will have a higher resolution.

Duplex - The capability of a scanner to scan two sides of a page.

Grayscale - In a grayscale each pixel is assigned a value of white, various shades of gray, or black. These bits are 8 bits larger than uncompressed black and white data, and more than 10 times larger than compressed black and white data.

ICR - Intelligent Character Recognition. ICR technology recognizes hand-written characters and translates the scanned images into ASCII characters.

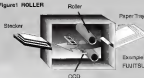
Image Enhancement - Image enhancement is a feature built into the scanner or on the host computer. It allows the operator to clean-up the images by increasing clarification, adjusting contrast, de-speckling and so allowing it usually involves manipulating the image by software.

OCR - Optical Character Recognition. This software allows a scanned, printed character (in series of black and white dots), to be translated into an ASCII character to be used in a word processor.

(Continued on page 25)

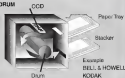
A Look at the different scanner transport and how they get the paper past the CCD

Figure1 ROLLER



The document goes between fed rubber rollers and is bent across the CCD array.

Figure2 DRUM



Takes the document on a drum past the CCD. Advantage returns the paper in front of the operator after scanning.

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A final word

Making the effort to be informed might seem time-consuming and more like playing on the side-lines than on the actual playing field but it is the key to setting yourself apart and ensuring your success.

Selling a scanner into a company can open doors but, a full scale imaging solution means much more than just a scanner sale for you. If you play your cards right, the total sale can include workstations, network upgrades, optical disk jukeboxes for image storage, high-resolution monitors, application software as well as consulting and integration fees. ☐

Malcolm Crocker is the National Sales Manager for Bell & Howell Imaging Peripheral Products Division. (800) 858-6700

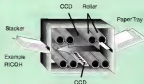
(Continued from page 20)

and commitment to service. The reliability of a scanner could be greatly undermined if the repair service is available and expensive.

It is probably not a good idea when dealing with various mutual approaches to recommend a new scanner without a track record.

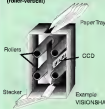
A Look at the different scanner transport and how they get the paper past the CCD

Figure3 STRAIGHT-THROUGH (roller)



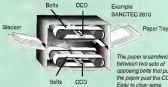
This transport also uses a roller to pull the paper past the CCD but it isn't curved.

Figure3A STRAIGHT-THROUGH (roller-vertical)



This type of transport is the same as number 3, only in a vertical position.

Figure4 BELT STRAIGHT-THROUGH



The paper is sandwiched between two sets of opposing belts that pull the paper past the CCD. Easy to clear jams.

Figure5 VACUUM STRAIGHT-THROUGH

Example: BANTREC 4000 PHOTOMATRIX

This kind of transport uses a vacuum to hold the paper against the belts as it passes the CCD. Fine double feeds.



DOCUMENT IMAGING TERMINOLOGY

Pixel - The smallest component of an image. Each character is made up of numerous pixels, and every image is made up of thousands of pixels.

PPM - Pages-per-minute. The number of letter size documents that can be scanned every minute.

Production Scanning - Massive critical, high-speed scanning with a large volume of documents which contain dated or very important information.

Rated Speed - The speed at which the scanner operates, as a defined dpi value (Remember: the greater the dpi, the slower the scanning speed).

Simplex - The capability of a scanner to scan only one side of a page.

Thresholding - A method to direct the scanner when to treat gray values as black and when to treat them as white. This is necessary when converting grayscale values (black, white or gray shades), to binary values (only black or white).

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Frequently Asked Questions:

Cyrix 6x86 Processor

Information from Cyrix Corp.

What is the Cyrix 6x86 processor?

The 6x86 processor, formerly the M1, is a multi-generation superscalar, superpipelined, x86 software-compatible processor.

How does it differ from the Pentium processor?

Most significant are the architectural differences which result in the 6x86 processor's superior performance gains. While both the 6x86 and Pentium processors are superscalar and contain an 80-bit floating point unit and a 16-KByte primary cache, other architectural features are found only on the 6x86. The 6x86 processor's integer and floating point units are optimized for maximum instruction throughput by using advanced architectural techniques

including register renaming, out-of-order execution, data dependency removal, branch prediction and speculative execution. These design innovations eliminate many data dependencies and resource conflicts to achieve high performance when executing existing non-compiled software programs as well as future x86-compatible code. And while the 6x86 processor achieves superior performance with existing software, it takes advantage of any recompiled code to gain an additional 3-10% performance increase.

What is the difference between the Cyrix 6x86 and 6x86 processor?

There are significant differences between these two Cyrix processors. The 6x86 process-

or, formerly the M16, is pin-compatible with a 486. However, the 6x86 uses many fifth-generation features (branch prediction, data forwarding, superpipelining, etc.) to achieve performance equal to Pentium processors. The goal for the 6x86 was to achieve an efficient design, obtaining the highest performance possible using the lowest transistors to obtain entry-level Pentium processor performance. A 100MHz 6x86 performs on par with a 75MHz Pentium processor.

The Cyrix 6x86 processor is a high-performance, multi-generation CPU that is iPM4 socket-compatible. It incorporates a 64-bit external data bus (6x86 use a 32-bit external data bus) and a variety of innovative

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- ☐ Purchasing and merchandising managers
- ☐ Product development managers
- ☐ Computer consultants
- ☐ Technical managers
- ☐ Design, systems and applications engineers
- ☐ Marketing, sales managers

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Which best describes your firm's primary business? (check one only)

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- ☐ Mass assembler
- ☐ Consumer electronics/office machine dealer
- ☐ Value added assembler
- ☐ Distributor/wholesaler/hardware manufacturer/OEM
- ☐ Software developer
- ☐ Systems integrator/software consulting
- ☐ Component purchasing agent
- ☐ Computer maintenance/service company
- ☐ Other third party and allied service firms

The systems my organization integrates are mostly based on the following (check all that apply)

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- ☐ DB/DB compatibles ☐ Unix
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What is the number of employees at this location?

(check one only)

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- ☐ 1,000 - 1,999 ☐ Less than 20
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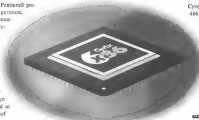
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architectural features that enable it to outperform higher-priced Pentium® processors: superior configuration, superpipelining, register renaming, data dependency removal, multi-branch prediction, speculative execution and out-of-order completion. These advanced architectural techniques eliminate many data dependencies and resource conflicts inherent in other processor designs. Additional design information can be found in the 6x86 Architectural Brief.

What are the performance results for the 6x86 processor?

Cyrix list full 6x86 performance results for several benchmarks on their Web site. Overall, the tests show that the 6x86 100 processor crushes published test results for the fastest i386 Pentium systems.



Can the 6x86 processor run 16-bit and 32-bit software?

Yes. The 6x86 was designed to run existing 16-bit software as well as new 32-bit software.

How can I purchase the 6x86 processor?

Cyrix processors — 6x86, 6x86 and 486 families — are sold only to manufacturers directly in volume quantities, and through distributors to qualified dealers and integrators who build and sell new Cyrix-based PCs. Cyrix do not market these processors directly to home computer or business users as processor upgrades.

Is the 6x86 processor compatible with the existing software?

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Digital and ISDN modems

by Steve Ebrington

Over the past year or so things have gotten rather complex when it comes to modems. Many computer vendors are now promoting "digital modems" with their routers and other remote access equipment. What is a digital modem? Unfortunately, the term "digital modem" can refer to three different things: a CSU/DSU, an ISDN TA/NT or a modem capable of receiving digital bits in and out with the analog modulation/demodulation being done internally.

A bit confused? Here is some:

A true analog modem can only run up to 33,600 bits per second over ordinary telephone lines. Dedicated or switched circuits running faster than that will typically use a Channel Ser-

vice Unit / Digital Service Unit (CSU/DSU) on the line. These units power the line and look much like an ordinary data communications modem. Because the link is digital from end to end, there is no need for an analog signal so CSU/DSUs are not really true modems. Nevertheless, many people do refer to them as "digital modems".

An ISDN (Integrated Services Digital Network) TA and NT) are often combined into one unit and sometimes called a "digital modem". The NT1 (Network Termination Unit One) provides power to the line and takes the 3-wire ISDN line in through a "U" interface and converts it into a 4-wire line. The output to the TA goes through an "S/T" bus. If you buy a device with an "S/T" interface you will also need to buy an external NT1. If you are buying a router with a "U" interface then you can usually just plug the phone line directly into it.

The Terminal Adapter (TA) takes the 4-wire line and connects it to a router or other communications equipment. The TA also performs some control functions on the line such as "hooking" the two 64,000 bit per second ISDN B channels into one 128,000 bit per second channel. The TA and NT1 are often combined into one unit and sometimes even incorporated into a router.

Most recently, the term "digital modem" has come to mean a modem which receives digital input and also has digi-

tal output. A brief digital-to-analog conversion is done within the modem but the output is digital. A normal analog modem typically receives digital input and outputs an analog wave.

Why would someone require such a modem? Imagine that you are an Internet Service Provider (ISP) with a mix of clients. Some call in digitally, using dedicated lines or ISDN, and some customers call in using analog modems. You could run separate modems pools with TA/NT1s, CSU/DSUs and analog modems but this is rather cumbersome. Also, you may have chosen to consolidate all of your incoming calls onto a high bandwidth digital line like a T1.

Handling your digital calls is straightforward enough, but what about your analog dial-up customers? The modem at the customer's end is encoding the original bit stream from their computer in an analog wave and sending it over the phone line. At the telephone switch the call becomes re-digitized and remains digital thereafter as it travels through the phone system and is delivered to your ISP on a digital phone line like a T1 link. In order to decode the call a modem must turn the phone company's digital bit stream into an analog signal and then re-digitize it into a form that the router can use. A digital modem does this conversion internally resulting in a digital-in, digital-out process.

Another common related phrase is "ISDN modem". This typically refers to a TA/NT1 unit, however some vendors have started to put both an analog modem and a TA/NT1 in one unit. Some ISPs suggest these unit to their clients because it allows ISPs who can only receive analog calls now, to upgrade to ISDN at the future without their clients having to buy new equipment. It also allows people like telecommuters, who have ISDN residential lines, the ability to dial into bulletin boards and other "analog only" services. ☐

Steve Ebrington is a Marketing Manager of ZED Data Systems. He can be reached by email at se@zed.com or voice (604) 473-9337.



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Simplifying the Networks of the Future



by Gus Maleki

ATM (Asynchronous Transfer Mode) is widely touted as a hot new technology - the all-singing-all-dancing goal to usher in the next generation of the networking. It may come as a surprise to the average user to learn that the true beauty of ATM actually lies in its potential to eliminate complexities in network design.

If fact, the inherent simplicity of ATM is what sets it apart from existing networking technologies. Its scalability and bandwidth enable the simplification of network design - and this simplification should be the goal of any organization wishing to reach maximum operating efficiency.

By providing an order of bandwidth that is considerably more than is needed, ATM can return networking to the time when the network was unadaptable and management was simple. When questioning the need for ATM in production networks, detractors of the new technology often argue that the majority of applications currently used do not need the magnitude of bandwidth provided by ATM; this is a fundamental misunderstanding of the benefits of bandwidth in the network.

Bandwidth provides simplicity - when there is more bandwidth than is needed, it is easy to design a network to meet the needs of the organization. Complexity is introduced when lack of bandwidth forces the network manager to distribute and redistribute bandwidth, constantly redesigning the network to match the organization's changing demands. In short, networking gains are greatest to successfully design and maintain networks that suffer from bandwidth constraint, and gains are by definition expensive to employ and always in short supply.

With its tremendous bandwidth and quality of service, most of the hype around ATM is based on its potential for multimedia and seamless LAN, MAN and WAN networks. Yet ATM's most practical application with most benefit to users today is in the ever-expanding backbone. ATM in the backbone provides three major benefits:

it works with the existing installed base of network equipment; it is standards-based and will provide full interoperability across the industry; and it solves the cost of ownership. Reducing bandwidth congestion in high-traffic LAN networks goes a long way toward solving most corporate networks' immediate problems, and reliable ATM-based products at reasonable prices are now available.

Meeting the dual challenge of offering practical solutions today while keeping a few steps ahead of growing corporate networks ATM technology promises to carry contemporary network design forward into the next generation. □

Gus Maleki is General Manager of 3Com Canada in Toronto.




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A Generalized Way of Thinking About Multi-Tier Client/Server Architectures

by George Schwab

By now most people use the term "client-server" when talking about group computing with PC's on networks. PC network computing, of course, evolved before the client-server model started gaining acceptance in late 1980's. These first PC networks were based on the file sharing metaphor illustrated in Figure 1. In file sharing, the server simply downloads or transfers files from the shared location to your desktop where the logic and data for the job run in their entirety. This approach was popularized mostly by Xerox-style products (dBASE, Paradox and Clipper). File sharing is simple and works as long as shared usage is low; update contention is very low and the volume of data to be transferred is low compared with LAN capacity.



Figure 1

As PC LAN computing moved into the 90's and the birth of today's client-server computing, two things happened. The first was that these first generation PC LAN applications and their users both grew, sometimes straining the capacity of this technology. Multivuser Xerox technology can provide satisfactory performance for up to 50 users, but it's very rare to find a successful implementation of this approach beyond that point. The second change

was the emergence and then dominance of the GUI metaphor on the desktop. Very soon GUI presentation formats, led by Windows and Mac, became mandatory for presenting information.

The architecture and technology that evolved to answer this demand was client-server, in the guise of a two tiered approach. By replacing the file server with a true database server, the network could respond to client requests with just the answer to a query against a relational DBMS (rather than the entire file). One benefit to the approach, then, is to significantly reduce network traffic. Also, with a real DBMS, true multi-user updating is now easily available to users on the PC LAN. By now, the idea of using Windows or Mac style PC's to front end a shared database server is familiar and widely implemented.



Figure 2

In a 2-tier client-server architecture, as shown in Figure 2, RPC's or SQL are typically used to communicate between the client and server. The server is likely to have support for stored procedures and triggers. These mean that the server can be programmed to imple-



ment business rules that are better suited to run on the server than the client.

The result is a much more efficient overall system.

Since 1992, software vendors have developed and brought to market many products to simplify development of applications for the 3-tier client-server architecture. The best known of these tools are Microsoft's Visual Basic, Borland's Delphi and Sybase's PowerBuilder.

The 3-tiered client-server architecture has proven to be very effective in solving workgroup problems. "Workgroup", as used here, is loosely defined as a dozen to 100 people interacting on a LAN. For bigger, enterprise-class problems and/or applications that are distributed over a WAN, use of this 3-tier approach has generated some problems.

Client/Server in Large Enterprise Environments

What typically happens with client-server in large enterprise environments is that the performance of a 2-tier architecture demonstrates as the number of on-line users increases. The primary reason this occurs is due to the connection process of the DBMS server. The DBMS maintains a thread for each client connected to the server. Even when no work is being done, the client and server exchange "keep alive" messages on a continuous basis. If something happens to the connection, the client must go through a session reinitiating process. With 50 clients and today's typical PC hardware, this is no problem. When one has 1,000 clients on a single server however, the resulting performance isn't likely to be satisfactory.

The industry has responded with a layered software solution for customers who need

Continued on page 16

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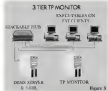
more scalability and performance than the 3-tier architecture can provide. The idea is to insert a third, middle layer of queuing software between the client and server. The result, then, is that the synchronous process of the 3-tier approach becomes asynchronous. In addition, the middle layer adds scheduling and prioritization for the work in process.

The use of an architecture with such a middle layer is called "3-tier" or "middle-tier." These two terms are largely synonymous in this context.

3-Tier With a TP Monitor

One type of middle layer is the transaction processing monitor or TP monitor. You can think of a TP monitor as a kind of message queuing service. The client connects to the TP monitor instead of the database server. The transaction is accepted by the monitor, which queues it and then takes responsibility for managing it to correct completion.

TP monitors first became popular in the 1970s on mainframes. On-line access to mainframes was available through one of two metaphors - time sharing or transaction processing (OLTP). Time sharing was used for program development and the computer's resources were allocated with a simple scheduling algorithm like round robin. OLTP scheduling was more sophisticated and priority driven. TP monitors were almost always used in this environment, and the most popular of these was IBM's CICS (pronounced "kicks").



As client/server applications gained popularity over the early 1990s the use of TP monitors dropped by the wayside. That happened principally because many of the services provided by a TP monitor were available as part of the DBMS or middleware software provided by vendors like Sybase, Oracle and Oracle. These embedded (in the DBMS) TP services have acquired the nickname "TP Lite." The "Lite" term comes from experience that DBMS

based transaction processing works OK as long as a relatively small number (<100) of clients are connected.

TP monitors (TP Heavy) have staged a comeback because their queuing engines provide a throttling effect, reducing the number of threads a DBMS server needs to maintain. The client connects with the monitor, which accepts the message and queues it for processing against the database. Once the monitor has accepted the message, the client can be released for further processing. The synchronous session based computing of a 3-tier architecture, then, becomes asynchronous through the insertion of the TP monitor into the equation. The monitor smooths out and lowers the overhead of accessing the database server.

Some other key services a monitor provides are: the ability to update multiple different DBMS in a single transaction, connectivity to a variety of data sources, including flat files, non relational DBMS and the mainframe; the ability to attach priorities to transactions, and robust security, including Kerberos. The net result of using a 3-tier client/server architecture with a TP monitor is that the resulting environment is FAR more scalable than a 3-tier approach with direct client to server connection. For really large (e.g., 1,000) user applications, a TP monitor is one of the most effective solutions.

As you might expect, however, there is a downside to network based TP monitors. At this point in time, the major problem with using this approach is that the code to implement TP monitors is usually written in a lower level language (like COBOL) and support for TP monitors is not (yet) widely available in the most popular virtual tools like PowerBuilder or Visual Basic.

3-Tier With an Application Server

Another type of 3-tier architecture is the application server (illustrated in Figure 4). With this approach, most of the application's logic is moved from the PC and into a common, shared host server. The PC is basically used for presentation services - not unlike the role that a terminal plays on a mainframe. Of course, because we are talking about a real PC here it still has the advantages of being used for client-side application integration (via GUI or other approach) if desired.

The application server approach is similar in overall concept to the X architecture that was developed at MIT in the 1980's. In X the goal is to allow host based computing with graphical interfaces on the desktop (I'm using the term "desktop" here because in the X architecture, the term "server" refers to the graphical server which sits on the desktop and



the term "client" refers to where the application runs - on the shared host).

The similarity between X and a 3-tiered client/server architecture with an application server is that both architectures have the goal of pulling the main body of application logic off the desktop and running it on a shared host.

The application server is also similar to a mainframe in that it doesn't need to worry about driving a GUI, and therefore it's a shared business logic, computation and data retrieval engine. This server normally operates under a 32 bit multitasking OS like NT, OS/2, NetWare or UNIX. As an option, these OS' all run on symmetric multiprocessing (SMP) configurations. In addition, some are available on massively parallel hardware. Therefore, the server is very scalable in terms of performance.

As new versions of the application software are developed and released, the installation of this software occurs on the one server rather than hundreds or thousands of PC's.

3-Tier With an Object DBMS

A variation on this theme of application server is the idea of using an object DBMS (ODBMS) as the middle layer. In this sense, the ODBMS acts as an accelerator or "hot cache." Data in a relational DBMS is usually stored in normalized fashion across many tables and for access by different applications and users. The generalized form of storage may

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(Continued from page 36)

price) inadequate (performance wise) for the needs of any one particular application. An ODBMS can be used to retrieve the data from the common store, assemble it for efficient output by your application and provide a persistent store for this data as long as your application might need it. Since structured data types like video or voice are not typically supported in today's RDBMS, these data types might also be stored in the ODBMS which could then associate the appropriate multimedia data with the data retrieved from the RDBMS. Figure 3 illustrates this approach.



Figure 4

3-Tier With a Messaging Server

Messaging provides still another technology to implement 3-tier computing. It is available today from companies such as IBM, DEC, Sybase and Oracle. A messaging server acts in the same way as a TP monitor by providing a funneling process. And, like a TP monitor, a messaging server provides connectivity to data sources other than RDBMS. The messages themselves have many characteristics in common with distributed objects. Messages are processed asynchronously with the appropriate priority level. The result is better utilization of resources with no ability to support more clients than synchronous processing would provide.

Messaging systems are designed for robustness. By using store and forward logic, they provide message delivery after and around failures. They also provide independence from the existing technologies such as wired or wireless or protocols. Because messaging systems support an emerging wireless infrastructure they should become popular for supporting mobile and occasionally connected workers.

A typical message server architecture would look like Figure 4, which, of course, looks just like the other 3-tier approaches we've already outlined. If you're unwilling or unable to wait for the arrival of distributed object technologies to build your application you can con-

struct a reasonable client using the messaging approaches that are now available. When distributed objects are a reality, you can migrate your application, if that seems like the best move.

Distributed Components & the 3-Tier Architecture

This brings us to distributed object computing and components. The emergence of an industry for component based software is absolutely dependent on the prior emergence of industry standards for interchangeable parts. For components to be assembled like LEGO toys, they are going to have to match up in terms of connectors. Translated, that means that all vendors who want to create software components are going to have to agree on the software object bus. There are only two real candidates for such a standard backbone: Microsoft's COM and OMG's (Object Management Group and CIL's (Component Integration Laboratory) implementations as CORBA and OpenDoc. It isn't the purpose of this article to explore this issue, but it



Figure 5

can be mentioned that not enough of either network OLE or CORBA technology is currently available for ordinary mortals to build with. By 1997, however, it's probable that both will be available and that they will be interoperable (through initiatives of CIL).

Client/server architecture is the distributed component world should then look some thing like Figure 7.

(Continued on page 42)

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The distributed object implementation of client/server computing is going to change the way applications are built. There should be some very interesting advantages to observe. For one, if we needed fast internal computing, we could implement copies of objects onto multiple servers. That way if any were down, it would be possible to go to another site for service. With distributed objects being self-contained and executable (all data and procedures present) it will be possible for a systems administrator to tune the performance of the network by moving those objects from overloaded hardware to underutilized computers. This approach is called tuning through "drag and drop," referring to the metaphor the administrator uses as a workstation to move the components. (This technology is available today in products from Dynasty Technologies and Frost Software).

Data Warehouse & 3-Tier

A 3-tier architecture is also useful for data mining or a warehouse types of applications. These applications are characterized by incorporated browsing of historical data. The databases supporting this type of application can sometimes be huge (up to a few terabytes - 10,121 bytes) and have to be structured properly for adequate performance (a few second turnaround).

Data mining and decision support applications typically need response times of a few seconds. If the system can't provide that level of performance, the thought process of the human analyst is disrupted and the overall purpose of the system is failed! A production database established for multiple users isn't typically in a form that can support ad-hoc requests. The approach to support this browsing is then to make data copies available for fast browsing and to organize those copies in the best supporting fashion. This typically means that the data is de-normalized, unnormalized and stored in a multi-dimensional table - all of which is very non-relational. IT systems and operations managers usually don't want access to those tables to be on the mainframe. Unpredictable performance from ad hoc browsing can have a nasty impact on production OLTP systems that require predictable response times.

For cost, management, security and other reasons, it makes sense to load this data copy on its own server, rather than leaving it on the mainframe. When this server is called OLAP - on-line analytical processor. In other circumstances the server can be a symmetric or massively parallel processor running an RDBMS. (There is an industry debate going over whether OLAP storage or RDBMS storage is the best for



Figure 8

this purpose). Since the OLAP server is typically a UNIX or PC based technology, the MIPS costs are much lower than the same cycles executed on a mainframe. Figure 8 illustrates this approach. (The graphic for mainframe is a little different, of course, but the reader has probably noticed that nothing has really changed architecturally here from any of the other multi-tier approaches already discussed).

By now the point is made: Client/server architectures are flexible and modular. They can be changed, added to and evolved in numbers of ways. All of the above described 3-tier approaches could be mixed and matched in various combinatorial sequences to satisfy almost any computing need.

3-Tier and the Internet

Of course, we haven't seen the last of innovative ideas in multi or 3-tier architectures. Client/server is evolving to the dominant computing paradigm of the 1990's. The recent headlines about Java, the Internet, Internet's and such as, of course, simply about another mani-



Figure 9

festation of client/server computing. Much of this publicity has been passed by companies such as Sun and Oracle, who see Internet based client/server as an emerging market that Microsoft doesn't dominate and (therefore) they can influence.

In the remainder of this article we'll explore a little about how access to the Internet adds richness and alternatives to client/server computing. One way to think about the Internet is as a large public TCP/IP network based on packet switched technology. Access to this network is through a server(s) that converts your LAN's protocol into TCP/IP and arranges for proper routing for the services you use. Your Internet access gateway might run a firewall or other security services also. The ultimate potential, of course, of the Internet is that as the security and capacity issues become resolved, it offers communications services that are much (order of magnitude) cheaper than private networks. By the time you read this, there will be products (e.g. HotBooks from Exodus, Shoreline, Mass, 617-268-0721) that offer Gopher access over the internet. This makes it very easy to use the Internet to your company's WAN. Of course, you're going to be competing for bandwidth with Joe College as he transmits photos from the homecoming party to his high school buddies. Whether or not and how fast access such as predictable performance are resolved is not the point of this article. Here we will just discuss applications that might be built for the Internet.



Figure 10

The applications that are available now are typified by the technology presented in Figure 10. This might be characterized as a new form of electronic publishing, but it's richer in some ways than books because it's online/digital publishing. Today most home pages consist of text, photos and graphics. By the time 1996 rolls, however, it's likely that animation and 3D applications will be available. Real-time video downloads off the Internet are another technology that has been frequently discussed.

Even with MPEG data compression, the bandwidth requirements are still much beyond what appears to be widely available in the 1990's. The technology "Quality of service" relies on its ability to guarantee enough bandwidth by reserving capacity ahead of time. We'll see how quickly this becomes reality.

(Continued on page 44)

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(Continued from page 42)

First generation web applications are quickly going to be joined by newer more capable environments that perhaps we can call the second generation. Two things will define this newer generation - 1) support for active clients via downloadable applets, and 2) live DBMS links that enable the server to know who you are from page to page and visit to visit. These newer types of applications will soon (maybe by the time you're reading this) become enabled to distributed applications that have been implemented in languages like Sun's Java or

Microsoft's CLE/Visual Basic. Sun describes its HotJava browser/Java language technology as "simple, object-oriented, distributed, interpreted, robust, secure, architecture-neutral, portable, high-performance, multithreaded and dynamic." The way that this will work is for your browser on the client to have a Java or VB applet/program that can activate a component that has been downloaded to your client from the Web server. Your browser becomes even driven, then, and can exhibit various types of behavior. This browser enterprise engine, of course, will enforce security for your client and make sure that any downloaded applets don't behave in a malicious fashion.

The addition of DBMS capabilities to the HTML processes on the server will allow HTML scripts to have memory. Right now when you're browsing a Web page it shows you static views of material that was designed before you showed up. Your connection to that site is "stateless." This means that the server has no memory of who/what you are and what you're requested before. As the leading DBMS vendors add connections for Web servers, it becomes possible for that server to remember who you are and what you've done from page to page and from

visit to visit. The interaction, then, becomes a lot more intelligent and useful.

3-Tier and the Future

The Internet is a very new area of technology, but I don't think it fundamentally changes anything as far as client/server architectures are concerned. Client/server still remains the only and best architecture for taking advantage of the Internet and other new technologies that come along. We'll have to add "changes in client/server computing" to death and taxes in our inevitable list. But, regardless of what comes, client/server computing is likely to remain the underpinning for most computing developments we'll see over the next decade. □

Dr. George Schumail is the Chairman of Software & ClientServer World April 11-12, 1996 at the Metro Toronto Convention Centre. In Dr. Schumail's Keynote Address he will be reviewing the most exciting new technologies in ClientServer computing. For more information on Dr. Schumail's appearance at Software World & ClientServer World please call DGI at 368-4770-M70. Other articles by Dr. Schumail can be viewed on the Web at <http://dgi.sgi.com>

2nd GEN APPLICATIONS



Figure 81

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New CEO for Globelle

Globelle Corp. announced that Mr. Shafer has resigned as President and Co-Chief Executive Officer of Globelle. Geoffrey Mann, currently the Co-Chief Executive Officer of Globelle, will become the sole CEO.

Mr. Shafer, who has been living in Israel, advised the Board that he would not be in a position to devote the necessary time to the affairs of Globelle required as a senior officer. Mr. Shafer believes that, with the depth of management now in place at Globelle, his presence on a full-time basis was no longer required for the Company to grow and prosper. Mr. Shafer remains a significant shareholder of Globelle and intends to remain as a director. Mr.

Shafer has agreed to accept the position of Honorary Chairman of Globelle and to perform consulting services on behalf of Globelle.

Novell Canada does management reorganization

Novell Canada announced an organizational restructuring to meet the challenges of the Canadian market. Don Chapman, VP and GM of Novell Canada Ltd. made the following appointments:

Michael O'Brien, formerly director of marketing, has been appointed to the new position of national marketing manager. O'Brien will oversee the development and implementation of the Customer Executive Program.

Thomas Rhett, formerly director of sales, assumes the position of director of marketing. Rhett will oversee all advertising, public relations and sales support initiatives.

Janey Sauter, formerly central regional sales manager, has been appointed national sales manager for Canada. Sauter will leverage Novell's channel programs to enhance the capabilities of Canadian partners.

David Toms, formerly area manager - major market sales, has been appointed major markets sales manager for Canada. Toms will develop and manage a national level account strategy including government, commercial and private sector accounts, OEM partnership and licensing.



The Western Canada Computer Distributors See top level's first Annual meeting where they selected a new board of directors - (l-r) Charles Lam from Supercorp, Roger Ho from Comoscan Computer Centre, Anthony Tang from Finetronics, Henry Liang from Dream Marketing, Thomas Fung from Sales Systems S & B, Wong from S20 Computer, Gary Brucchi from Globelle, Simon Chiu from TPM, Ivan Lee from Golden Dragon, David Koo from Lonsco Group and John Corcoran from Compvision Technologies.

NEW BUSINESS

Canon Electronics opens Richmond, BC office

Canon Electronics announced the opening of a new Canadian sales office in Richmond, BC. Canon's office will provide sales and support of memory products as the OEM, government, distribution and reseller channels. Contact: (604) 274-5885.

TTX opens office in Richmond, BC

TTX Canada Inc. announced the addition of a full stocking distribution and sales centre in Richmond, BC that now gives TTX coast-to-coast coverage. Contact: (604) 278-5255.

NEW PRODUCTS

Digital's RAID up performance by 67%

Digital Equipment of Canada announced a 67% performance boost to the StorageWorks RAID Array 440, making it the fastest and most reliable RAID subsystem available for multiprocessor environments. Through enhanced Veritas 3.7 firmware, the RAID Array 440 performance has been increased to 4,350 I/Os with a single controller configuration. The system is compatible with HP-UX, IBM AIX, Sun Solaris and Sequent environments. Support for Windows NT is slated for early 1996.

Epson Personal Document Station for the Mac and PC

The Epson Personal Document Station (PDS) includes a complete file management suite that also contains a full optical character

recognition (OCR) software package, able to fax and scan e-mail capabilities. It also uses Epson's Text Enhancement Technology and Auto-Area Segmentation for the most accurate OCR and image scans anywhere. The PDS is an 8-bit gray scale scanner with 300 dpi optical resolution. It comes with Second Glance Software's e-Paper, a full document archive and management suite. e-Paper contains single-click document processing and automatic paper detection.

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Digital offers Internet Services roadmap

Digital Equipment of Canada announced an Internet Services Roadmap, a set of Internet services designed to provide Internet users and service providers with every level of service and support required to operate effectively and securely on the Internet.

This includes consulting, security, testing, support services, systems integration services to help customers plan business applications and develop or integrate solutions related to the Internet, network services to assist customers in establishing the network infrastructure required for Internet access, and processing services for those who do not want to manage Internet-specific services internally.

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Abstract



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Point: the power off are all near 100%.

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by Alex Zisman

What's new on CD-ROM players

Even though they're not getting the hot media attention, CD-ROM players have been rapidly evolving over the past year—with a sense that even bigger changes are on the horizon. Some of the areas to watch:

quickly replaced by the next generation. Now, quad-speed is the current standard, with some manufacturers pushing it a bit, offering 4.4 speed for a modest performance boost.

newer games, in particular, or other software including video clips will be optimized for quad-speed, letting users of quad and faster drives see improved performance (while users with slower drives will suffer from dropped frames).

Four, four, four CDs in One

— review of NEC's MultiSpin 4x4

What can you do with last year's buzz word?

A year or two ago, the buzz word was 'multimedia'. Upgrade your computer, add CD-ROM and sound. And it worked—a whole industry devoted to multimedia upgrades of existing machines sprang up. But it's almost become a victim of its own success—over half of the computers sold for the home market now include multimedia features, with some predicting that by the end of 1996, this will be true of virtually all home computers.

Instead, this year's buzz word, 'Internet' receives the bulk of the media hype (at least whatever wasn't directed at Windows 95)—and multimedia gets taken for granted.

So if you're a repeated purchaser of CD-ROMs, such as NEC, what can you bring to market? You can make machines that are faster—single speed drives were replaced by double-speed, and then, after a few triple-speed models appeared, quad-speed drives have become the new industry standard. Some companies are marketing six- and eight-speed drives.

But multiplying the speed of the drive doesn't really produce the benefits that you might think—while games optimized for quad-speed drives are now beginning to appear, most software is still optimized for double-speed drives, and meaning that software on a faster drive, users will see at best, a more modest increase in performance than they expected.

(Comment on page 88)

Product Information

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speed

reliability

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multi-players

capacity

Speed Single-speed drives have totally vanished from the shelves, and double-speed drives have disappeared from all but the mark-down sell-out counters. A few triple-speed models appeared, but were

Six-speed and even eight-speed models have started to appear, but with current software still mostly optimized for double-speed, users don't get the full performance benefit. By the end of this year, most

Attachment Initially, users had a choice between SCSI and proprietary cords. SCSI was standard, and offered better performance, but cost more, and often involved cumbersome set-up for PC users.

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What's new on CD-ROM players

speed

reliability

attachment

multi-players

capacity

(It's standard on Macs). Low-cost units such as the widely-distributed Panasonic and Mitsumi came with their own seeds, that only worked with their single model. Many users attached their CD-ROMs to their sound cards, but again had problems—unless they bought them together as a multimedia upgrade kit. It was easy to get units that wouldn't plug together.

Instead, a third alternative has arisen—sometimes referred to as ATAPI, it plugs the CD-ROM into the standard AT-bus using an enhanced IDE (EIDE) card—just like most PC hard drives. This is a low-cost alternative to SCSI, which while not

Multi-players At first, the 680 megs of a typical CD-ROM disc seemed like an almost-infinite amount of storage. Perhaps not surprisingly, games and other multimedia products have quickly found a way to need more. Microsoft's children's encyclopedia, *Encarta*, for example, at first planned for a single disc, ended up as a four disc set. Games started replacing animated sequences with more and more filmed video—and expanded to two, four, and even seven disc sets. Sort of like playing off multiple floppies in the late '80s.

Audio CD fans have been able to buy affordable multi-disc players for

Capacity If 680 megs is just too little, what about new formats? Conventional CDs are produced and read using red lasers... newer technologies using blue lasers have become available. Because blue light has a higher frequency (and shorter wave length) than red light, blue lasers can pack more information onto the same sized disc. Finally, a mutually agreeable standard has been set amongst the various factions in the computer, audio, and video industries... the new format is variously known as DVD, when used for audio and video, and SD-ROM for discs with predominantly computer data. SD-

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For many computer users, however, CD discs are becoming the floppy of the nineties. A decade ago, users welcomed reasonably priced hard drives (everything a relative—my first hard drive was a \$400 40-megabyte I bought in 1988) to eliminate constant floppy swapping. Now with many popular games requiring multiple CD discs, users are starting to feel limited by the mere 680 megs available on each disc.

Someday in the future, today's CDs will be replaced by tomorrow's standard—the multi-gigabyte DVD disc (also known as SD-ROM) holding music, video, and CD-ROM data. Of course, you'll need all new hardware to run that (speaking a glow in hardware vendor's eyes). But that's not yet... maybe 1997.

Instead, computer users have cast an envious eye at home stereo systems—multi-disc audio CD systems are increasingly common and affordable. But CD-ROM requires more precise and robust mechanisms to handle random access of data, and multi-CD-ROM machines have been rare and pricey, with a small market appealing mostly to retail operators, wanting to promote multi-page of files for dial-up access.

NEC's MultiSpin disc is trying to change all that. It's a standard-sized normal CD-ROM you don't affixable and easy to add to your current computer—while working as a four-speed, four-disc changer.

Like some car CD-players, it packs your discs in, using them internally—unlike older units, there are no caddies or cartridges.

(Continued on page 68)

H A R D W A R E R E V I E W S

providing as high performance as SCSI (especially in multitasking environments) will be acceptable for most stand-alone systems (network servers should probably stick to the more industrial-strength SCSI). One thing to watch out for—users can connect their hard drive and CD-ROM to a single EIDE card, but Windows for Workgroups will shut off performance-enhancing 32-bit File Access for the harddrive. The answer is a separate card and cable for each device.

years now, and three-disc video CD players are popular in Asia, but this solution has only started to catch on in the CD-ROM market. Now, suddenly, a number of models are available, loading between four and seven discs. Some require the discs to be pre-loaded into a cartridge, while some of the newer units, like the NEC MultiSpin four and seven disc units, or the comparable Nakanishi models allow users more spontaneity.

ROM discs will store multi-gigabytes of data, using blue-laser light and storing data in several layers on both sides of a standard-sized disc.

This standard will allow a feature length movie to be stored on a single disc, or to allow more flexibility mixing video, audio, and computer data all on the same disc. Of course, you'll need new hardware to make use of these enhancements—at least new players, both for your computer and your home audio/video setup...

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What's new on CD-ROM players

these may start being available as early as this Fall, and will be able to read the current generation of audio and data CDs.

to consider mastering their own CDs. Hard drive prices have dropped, but CD-R remains too pricey an option for most users (I'd love to be able to

disc drives? Multi-disc drives? CD-R? SD-ROM? I suspect that in the next six months to a year, many consumers will end up confused, and

(Continued from page 60)

to load. An internal elevator switches between discs. The result is a sleek package that fits neatly into the space taken by a standard single-disc player. Four buttons and LEDs on the front let the user select which disc will be accessed.

Unlike other NEC models, which used SCSI, the 4x4 uses the more common and affordable IDE interface—a card and cable are included. It can be set up in your choice of two modes. Single-drive letter mode lets you use all four discs as a single drive, often drive D. In Multiple-drive mode, each disc gets a separate drive letter—perhaps D, E, F, and G. Each mode has its advantages—the single-drive letter could make it easier to switch between discs in a multi-disc game, or to work with discs that have been installed with using an older, single-disc unit.

The multiple-drive mode could be nice if you always want to keep a reference disc, say an encyclopedia or Microsoft Bookshelf in one of the discs—it could always be accessed on drive G, regardless of what was being used in the other drives. If you're a Win95 user, you get no choice—those drives only support multi-drive mode, though NEC promises that future upgrades will offer the same features that DOS/Win 3.1 users already have.

Hardware and software installations are about as expected for any upgrade that requires opening the case. It went smoothly. NEC

packs a poster detailing the installation process, and even includes an installation videotape to help reassure those who are uneasy cracking open the case. Note that if you already have an IDE hard drive, you can install this drive on the same card, but you'll probably get better performance running it off its own adapter (which is included).

Once it's up and running, you'll find it in the middle of the pack of quad-speed CDs—no speed demon, but no slouch, either. Switching between discs is a smooth process, taking a couple of seconds to eject a disc, or four or five seconds to access a disc after loading.

With single-disc quad-speed drives hovering around \$300 as the norm, you may ask yourself whether this unit's \$399 price is worthwhile. It is double the price of a single-disc unit—but offers the capabilities of four single units. If you want multi-disc capabilities in a small, internal unit, you may find this well-packaged product good value. BB5 operates with a large tower system could consider buying three or four of these, for quick and easy access to 12-16 discs at a time. NEC is also marketing a seven-disc external model.

Alternatively, Canadian distributor GMS DataLink is marketing the Nakamura MU-44, featuring virtually identical hardware, for a similar estimated road price of \$399.



H A R D W A R E R E V I E W S

speed

recordability

attachment

multi-plotter

capacity

Recordability Even though consumer-level videotape offers a much lower picture quality than laserdiscs, it is much more popular. Why? Users like being able to tape off their TV, and are willing to live with lower quality to have that flexibility.

CD-R (for recordable) has been available for a few years, but units have been too high-priced for wide acceptance. As well, users need a large, fast hard drive, with lots of free space, before even being able

use it for archiving and backing up hard drives). Other manufacturers are offering more exotic solutions: Panasonic's LF-1000AB PowerDrive-2, for example, offers a combination standard read-only CD-ROM with a writable optical drive, at under the magic \$1000 price point, but the optical cartridges are expensive, and can't be read on standard CD-ROM drives.

Putting it all together—several of these trends seem to be going off in different directions. Faster single-

postponing purchases, at least for the higher-end units.

For those potential consumers, a low-priced quad-speed model may be fine for now, while it may be a good time to put off a large investment in a technology that may change dramatically over the next year or so. Distributors may want to watch technology trends carefully, and avoid carrying too much inventory in this potentially unstable market.

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